We claim:

1. A device for transport of molecules or energy across or into a biological barrier comprising:

one or more microneedles, each microneedle formed of a first material and a second material,

wherein the second material is dispersed throughout at least a portion of the first material or forms a portion of the microneedle.

2. The device of claim 1, wherein the first material is a polymer.

3. The device of claim 2, wherein the polymer is a biodegradable polymer.

4. The device of claim 3, wherein the polymer is selected from the group consisting of poly(lactide)s, poly(glycolide)s, poly(lactide-co-glycolide)s, polyanhydrides, polyorthoesters, polyetheresters, polycaprolactones, polyesteramides, poly(butyric acid)s, poly(valeric acid)s, polyhydroxyalkanoates, degradable polyurethanes, copolymers thereof, and blends thereof.

5. The device of claim 2, wherein the polymer is a non-biodegradable polymer.

6. The device of claim 1, wherein the first material, the second material, or both, comprise a metal.

7. The device of claim 1, wherein the first material, the second material, or both, comprise molecules to be released.

8. The device of claim 7, wherein the molecules to be released comprise a drug.

9. The device of claim 8, wherein the drug is a vaccine.

10. The device of claim 1, wherein the second material is dispersed homogeneously through the first material.

11. The device of claim 10, where the second material comprises rigid particles which enhance the mechanical strength of the microneedles compared to microneedles formed without the second material.

12. The device of claim 1, wherein the second material is a salt or other leachable particle.

13. The device of claim 1, wherein the second material is heterogeneously combined with the first material.

14. The device of claim 13, wherein the second material is layered over or within the first material.

15. The device of claim 13, wherein the microneedles have a selected weak linkage formed of the second material, which dissolves, degrades, or breaks after insertion into the biological barrier.

16. The device of claim 13, wherein the microneedle is formed of a first material and comprises a channel which extends longitudinally along the exterior surface of the microneedle, and wherein the channel is filled with the second material.

17. The device of claim 16, wherein the second material comprises a polymer matrix in which drug molecules are dispersed.

18. The device of claim 13, wherein the microneedle is formed of a first material and comprises an interior bore in which the second material is located.

19. The device of claim 18, wherein the second material comprises a drug or a polymer matrix in which drug molecules are dispersed.

20. The device of claim 1, wherein the second material is a sensor.

21. The device of claim 20, wherein the sensor is in a bore or channel in the microneedle.

22. The device of claim 1, further comprising a substrate from which a plurality of the microneedles extend.

23. The device of claim 1, wherein the microneedle has a length between about 10 and 1500 microns.

24. The device of claim 23, wherein the microneedles have a width between about 10 and 500 microns.

25. A device for transport of molecules or energy across or into a biological barrier comprising:

a substrate, and

a plurality of microneedles integral with or attached to and extending from the substrate,

wherein the microneedles have a beveled or tapered tip portion, a longitudinally extending exterior channel, or both.

26. The device of claim 25, wherein each microneedle is formed of a first material and a second material, the second material being dispersed throughout at least a portion of the first material or forming a portion of the microneedle.

27. The device of claim 25, wherein the microneedle comprises a polymer or a metal.

28. The device of claim 25, wherein the microneedle comprises molecules to be released.

29. A method of delivering molecules across or into a biological barrier, the method comprising:

inserting the microneedle of the device of claim 7 into a biological barrier; and

permitting the molecules to be released from the microneedle.

30. A method of delivering molecules across or into a biological barrier, the method comprising:

inserting the microneedle of the device of claim 28 into a biological barrier; and

permitting the molecules to be released from the microneedle.

31. A method of making microneedles comprising:

providing a mold having a plurality of microdepressions, each of which defines the surface of a microneedle;

filling the microdepressions with a first molding material; and

molding the material, thereby forming microneedles.

32. The method of claim 31, wherein the first molding material further comprises a second material dispersed therein.

33. The method of claim 32, wherein the second material is a pore forming agent or a structural element.

34. The method of claim 33, further comprising removing the pore forming agent, thereby forming porous microneedles.

35. The method of claim 32, wherein the second material comprises molecules to be released.

36. The method of claim 31, wherein the first molding material comprises a polymer or monomer.

37. The method of claim 36, wherein the first molding material is a monomer and the molding step comprises polymerizing the monomer.

38. The method of claim 36, wherein the molding material comprises a polymeric powder and the molding step comprises melting the polymer and then solidifying the polymer.

39. The method of claim 38, wherein the melting step is conducted under vacuum conditions effective to remove bubbles, if any, trapped in the melted polymer.

40. The method of claim 36, wherein the molding material comprises polymeric powder and the molding step comprises exposing the polymeric powder to effective amount of carbon dioxide to swell the particles and bond them to each other.

41. The method of claim 36, wherein the molding material comprises a polymer liquid or solution and the molding step comprises solidifying the liquid polymer by cooling or solvent evaporation.

42. The method of claim 31, wherein the microdepressions are in a shape to form microneedles which are hollow.

43. The method of claim 31, wherein the microdepressions are in a shape to form microneedles which have a tapered or beveled tip portion, one or more longitudinally extending exterior channels, or a combination thereof.

44. The method of claim 31, wherein the mold is made by a process comprising:

(a) microshaping a block of a first material to form a mold insert having a plurality of microprotrusions; and

(b) depositing a second material onto the microprotrusions to form a micromold having a plurality of microdepressions defined by the microprotrusions.

45. The method of claim 31, wherein the mold comprises a cross-linked polymer.

46. The method of claim 45, wherein the mold comprises a silicone.

47. A method of making polymeric microneedles comprising:

(i) forming a one or more layers of a monomer or polymer material on a substrate; and

(ii) selectively removing portions of the monomer or polymer material to form microneedles on the substrate.

48. The method of claim 47, wherein, in step (i), the monomer or polymer material on the substrate comprises a first layer of a first material and a second layer of a second material.

49. The method of claim 47, wherein the monomer or polymer material is crosslinkable and step (ii) comprises:

using an optical mask to crosslink selected portions of the crosslinkable material; and

removing the uncrosslinked portions of the crosslinkable material, wherein the remaining crosslinked material forms the microneedles extending from the substrate.

50. The method of claim 49, wherein the optical mask comprises a filled circle, or other filled geometric shape, having one or more notches therein, effective to form a microneedle having a longitudinally extending exterior channel.

51. The method of claim 49, wherein the optical etch mask comprises a partially filled circle, or other geometric shape, effective to form a hollow microneedle or microneedle having a closed bore.

52. The method of claim 49, wherein step (ii) further comprises:

applying a sacrificial polymer layer to the substrate to the height of the formed microneedles;

patterning a metal layer onto the surface of the sacrificial polymer layer of polymeric material to form a patterned etch mask; and

using reactive ion etching to shape the tip portion of the microneedles.

53. The method of claim 52, wherein the patterned etch mask is placed asymmetrically over the microneedles, effective to form microneedles having a beveled tip.

54. The method of claim 52, wherein the patterned etch mask is placed symmetrically over the microneedles, effective to form microneedles having a symmetrical tapered tip.